

the magnetisation established in the at least one annulus provides a torque-dependent magnetic field component which has a significant non-zero value at zero torque or force and an essentially zero value at a non-zero torque or force, as the case may be. <sup>2.10 specs</sup>

24. A transducer element as claimed in Claim 23 in which the at least one annulus is in the form of an annular ring attachable to a shaft, and the annular ring is of a magnetoelastic material and is circumferentially magnetised.

25. A transducer element as claimed in Claim 23 in which the at least one annulus is of magnetoelastic material and is a circumferentially magnetised, integral portion of a shaft.

26. A transducer element as claimed in Claim 23 in which the at least one annulus is longitudinally magnetised in the direction of said axis.

27. A transducer element as claimed in Claim 26 in which the at least one annulus is an integral portion of a shaft.

28. A transducer element as claimed in Claim 24 comprising a first annulus of magnetised material and a second annulus of magnetised material, wherein said first annulus provides an essentially zero value of magnetic field component at a non-zero torque or force of a given polarity and said second annulus provides an essentially-zero value of magnetic field component at a non-zero torque or force of the opposite polarity.

29. A transducer element as claimed in Claim 27 comprising a first annulus of magnetised material and a second annulus of magnetised material, wherein said first annulus provides an essentially zero value of magnetic field component at a non-zero torque or force of a given polarity and said second annulus provides an essentially-zero value of magnetic field component at a non-zero torque or force of the opposite polarity.

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30. A transducer element as claimed in Claim 23 in which said element has a surface extending radially of said axis and comprising a first annulus of magnetisation extending to said surface and a second annulus of magnetisation extending to said surface outwardly of said first annulus, said first annulus and said second annulus being magnetised to provide a magnetic field component therebetween which has a significant non-zero value at zero torque or force, as the case may be, and an essentially zero value at a non-zero torque or force, as the case may be.

31. A transducer element as claimed in Claim 30 in which said first annulus is magnetised in the direction of said axis with a pole of given polarity at said surface and in which said second annulus is magnetised in the direction of said axis with a pole of opposite polarity at said surface.

32. A transducer element as claimed in Claim 30 in which said first annulus and said second annulus are each magnetised to form a respective closed loop of circumferential magnetisation, and the respective closed loops of circumferential magnetisation are of opposite polarity.

33. A transducer element as claimed in Claim 27 comprising a respective further annulus of magnetisation located radially inwardly of the at least one annulus of magnetisation and longitudinally magnetised in the axial direction with a polarity opposite thereto to form a closed loop of magnetic flux therewith.

34. A transducer assembly comprising a transducer element as claimed in Claim 23 and a magnetic sensor arrangement oriented to detect said magnetic field component.

35. A transducer assembly comprising a transducer element as claimed in Claim 24 and a respective magnetic sensor arrangement for the at least one magnetised annulus and oriented to detect a magnetic field component in the direction of said axis.

36. A transducer assembly comprising a transducer element as claimed in Claim 26 and a respective magnetic sensor arrangement for the at least one magnetised annulus and oriented to detect a magnetic field component in the circumferential (tangential) direction about said axis.

37. A transducer assembly comprising a transducer element as claimed in Claim 28 and first and second magnetic sensor arrangements for detecting a respective magnetic field component emanated by said first annulus and said second annulus, each of said first and second magnetic sensor arrangements being oriented to detect a magnetic field component in the direction of said axis.

38. A transducer assembly comprising a transducer element as claimed in Claim 29 and first and second magnetic sensor arrangements for detecting a respective magnetic field component emanated by said first annulus and said second annulus, each of said first and second magnetic sensor arrangements being oriented to detect a magnetic field component in the circumferential (tangential) direction about said axis.

39. A transducer assembly comprising a transducer element as claimed in Claim 30 a magnetic sensor arrangement oriented to detect said magnetic field component provided between said first annulus and said second annulus.

40. A transducer assembly comprising a transducer element as claimed in Claim 31 and a magnetic sensor arrangement located to be responsive to the magnetic field between said first annulus and second annulus and oriented to detect a magnetic field component in the circumferential (tangential) direction about said axis.

41. A transducer assembly comprising a transducer element as claimed in Claim 32 and a magnetic sensor arrangement oriented to detect a radially directed magnetic field component between said first annulus and said second annulus.

42. A torque sensor system comprising a transducer assembly as claimed in Claim 37 responsive to torque applied about said axis, wherein said first and second magnetic field sensor arrangements provide first and second torque-dependent signals respectively, and further including signal processing means which comprises a first channel responsive to at least one of the first and second torque-dependent signals, said first channel comprising an output means having a controllable gain for producing an output signal representing a measure of torque, and which also comprises a second channel comprising means for combining the first and second torque-dependent signals to provide a reference signal, said output means being responsive to said reference signal to adjust its gain in a sense acting to eliminate changes in the response relating the first and second torque-dependent signals with torque.

43. A torque sensor system as claimed in Claim 42 in which the combining means is operable to effect a difference operation on said first and second torque-dependent signals.

44. A torque sensor system as claimed in Claim 43 in which the first channel is responsive to both of said first and second torque-dependent signals to effect a summing operation thereon.

45. A method of forming a transducer element which is as claimed in Claim 23 in which the magnetisation of said at least one annulus is performed while the transducer element is under a predetermined torque of one polarity about said axis.

46. A method of forming a transducer element which is as claimed in Claim 28 in which the magnetisation of the first annulus is performed while the transducer element is under a predetermined torque of one polarity about said axis, and the magnetisation of the second annulus is performed while the transducer element is under a predetermined torque of the opposite polarity about said axis.

47. A method of forming a transducer element as claimed in Claim 28 in which the respective magnetisation of the first annulus and the second annulus are performed to provide magnetisation of opposite polarity.

48. A method as claimed in Claim 46 in which the magnetisation of the first annulus and the second annulus are of the same polarity.

49. A method as claimed in Claim 47 in which the magnetisation of the first annulus is performed under a predetermined torque of opposite polarity to that applied in the magnetisation of the second annulus.

50. A method of forming a transducer element which is as claimed in Claim 30 in which the magnetisation of said first annulus and said second annulus is performed while said element is under a predetermined torque about said axis.

#### Remarks

Please enter this amendment prior to examination. The earlier Preliminary Amendment erroneously amended the claims in the original PCT patent application whereas the applicant had submitted replacement claims 1 - 28 shown in Exhibit A attached. See the replacement claims referenced in the International Preliminary Examination Report dated May 21, 2001. Hence, cancellation of claims 1 - 22 listed in the Preliminary Amendment is necessary and substitution of